PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Multiple Stage Vertical Gearing.

We, F. TACKE MASCHINENFABRIK K.G., (personally responsible partners, Franz Tacke, Albert Tacke, Karl Tacke, and Wilhelm Tacke), a German Company, of Rheine, Westphalia, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In order to obtain good lubrication with multiple stage vertical drives, the chamber of the gearing is often constructed as an oil container, which is filled with oil to such an extent that a part of the gear wheels, for example, the lower stage of the gearing, lies completely under oil. By the rotation of these gear wheels sufficient oil is thrown on the toothed wheels of the other gear stages, so that these in general receive a sufficient lubrication. Such an arrangement of the lubrication has, however, the great disadvantage that the liquid friction is considerable as the lower part of the gear dipping into the oil foams this up and consequently heats it considerably.

These disadvantages are avoided, according to the present invention, by the two stages of the gearing arranged over each other being carried in two lubricating containers separated from each other, and which are only so far filled with lubricant as to permit the gear wheels to dip into the lubricant with their lower parts. In consequence of the smaller dipping of the gear wheels into the lubricating liquid, the work exerted in friction is considerably reduced. In order to prevent a penetration of the lubricant from the upper into the lower container or into the bearing, etc., those gear wheels, the shafts of which pass downwards through the lubrication container, are curved on their under side into a dish shaped plate, the bottom of the container being raised to extend around the downwardly extending shafts above the liquid level of the lubricant. A special tight joint between the separate lubricant containers or between these and the bearings, is thus superfluous. In order to obtain a good lubrication of the gear wheels, guide plates are preferably arranged at their points of engagement which plates run approximately concentric to the gear wheels in the vicinity of the point of engagement thereof, the lubricant carried by the wheels being thus partly confined and raised up on the sides of the teeth at the points of engagement.

An example of carrying out the invention is shown in Figure 1 of the accompanying drawings in longitudinal section and in Figure 2 in plan. 11 is a motor with a vertical shaft 12 which carries at its lower end a spur wheel 13. This spur wheel 13 engages with a larger toothed wheel 15 arranged on the intermediate shaft 14, whilst the spur wheel 16 on this shaft is in engagement with the toothed wheel 18 carried on the working shaft 17. The gearing is enclosed by a casing 19, the upper part 20 of which is flanged directly on to the casing of the motor 11 and contains the step bearing 21 for the motor shaft as well as the upper bearing 22 for the intermediate shaft 14. The bottom 23 of the gear case serves to receive the bearing 24 for the intermediate shaft 14 and the bearing 25 for the driven shaft 17, the bearings being closed on the outside by the covers 26 and 27. In the gear case 19 is arranged, between the two gear stages situated one over the other, a horizontal partition 28 which surrounds the intermediate shaft 14 passing through it. At the point where the intermediate shaft 14 passes through, the partition 28 is provided with an annular wall 29 which extends into a ring shaped recess 30 of the gear wheel 15. The container 31 formed by the partition 28 and the upper wall of the casing 19 is filled with oil. The level of the oil here lies below that of the upper edge of the annular wall 29 so that the outlet of the oil from the container 31 is prevented. The gear wheels 16 and 18 situated under the partition 28 also dip into oil inserted in the container 33 formed by the bottom 23, the bottom 23 of the housing being also provided with an annular shaped wall 34 surrounding the shaft 17 for preventing the penetration of the oil into the bearing 25, this wall projecting into a recess 35 in the gear

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wheel 18. The gauge glass 36 serves to indicate the level of the oil in the container 33. In the partition 28 between the two oil containers 31 and 33 is arranged a short tube 32 through which the oil in the container 31 can flow over into the lower container 33. The tube 32 is covered by a cap 38 provided with openings which cap prevents too much oil passing through the tube 32 into the container 33 on the rotation of the gear wheels 13 and 15. An opening 39 made in the cover 20 of the gear case enables oil to be subsequently supplied. In order to prevent as far as possible the oil from leaving the gear case, the joint between the bottom 23 and the side wall 19 of the gearing is situated above the level of the oil in the container 33, so that no oil can penetrate into this joint.

Figure 2 shows a cross section on the plane A—B of Figure 1. As will be seen from Figure 2 guide plates 37 are fixed on the bottom of the lubrication containers, in the vicinity of the point of engagement of the gear wheels, which plates run approximately concentrically to the gear wheels. By means of these guide plates the oil carried with the gear wheels is somewhat confined so that it rises on the backs of the teeth at the point of engagement and covers the gear wheels over the whole of their teeth. To increase this damming action, guide ribs may be arranged at the bottom of the oil container or the circulation of the oil can be increased by spade-shaped projections on the lower front surfaces of the wheels, so that the oil can rise more easily on to the sides of the teeth of the gear wheels.

The arrangement of the separated oil containers is independent of the kind of teeth forming the gear wheels. It can be used with equal advantage with teeth of straight shape, as well as cut on an angle.

The lubricating arrangement constructed according to the invention takes up little room, as even with small dimensions of the oil containers a certain and sufficient lubrication of the gear wheels can be obtained. Furthermore, the attendance and control of the lubrication is extremely simple in consequence of the arrangement of an overflow pipe between the oil containers as even with the arrangement of several oil containers situated one over the other for multiple gear stages, the oil need only be supplied to the upper container and is distributed automatically into the other container.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A multiple stage vertical drive, characterised by the stages of the gear, situated one over the other, being arranged in lubricant containers separated from each other and which are so filled with lubricant that the gear wheels only dip with their lower part into the lubricant.

2. Apparatus according to claim 1, characterised by the shafts passing downwards through the bottom of the lubricant containers being surrounded by a ring-shaped wall, the upper edge of which is higher than the level of the lubricant and projects into a ring-shaped recess of the gear wheels.

3. Apparatus according to claim 1 or 2, characterised by guide plates being arranged on the bottom of the lubricant containers in the vicinity of the points of engagement of the toothed wheels.

4. Apparatus according to claim 1, characterised by the dividing joint between the bottom and the side part of the gear chamber being situated at a higher level than the level of the lubricant which is in the container formed by the bottom of the chamber.

5. Apparatus according to claim 1, characterised by an overflow pipe being arranged in the partition between the oil containers through which the outlet of the lubricant from the upper into the lower container is possible.

6. A multiple stage vertical drive substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 11th day of April, 1929.

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[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 1

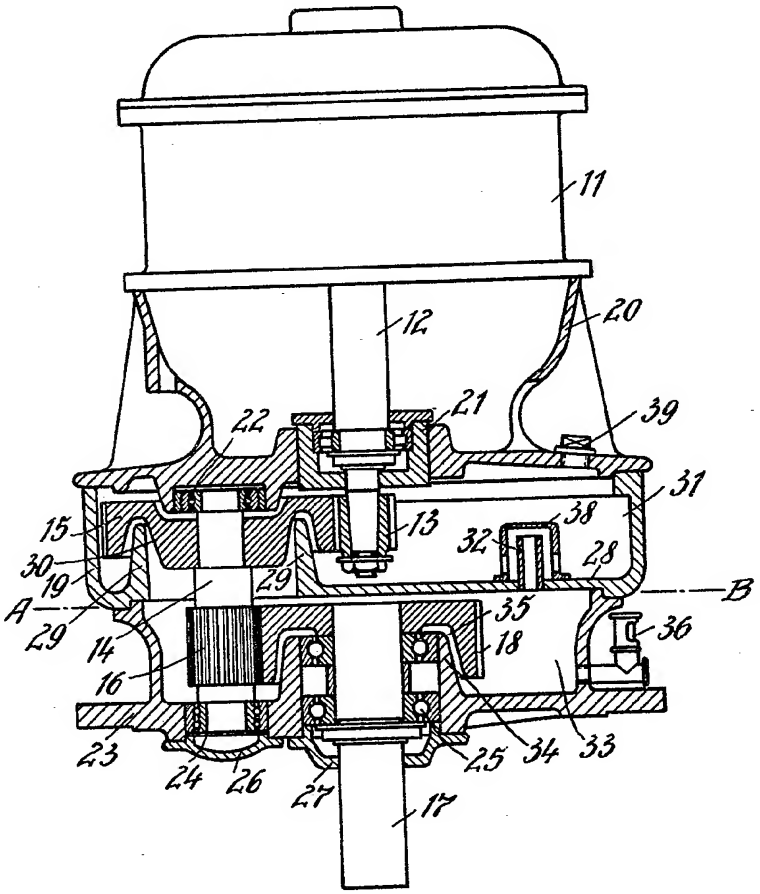
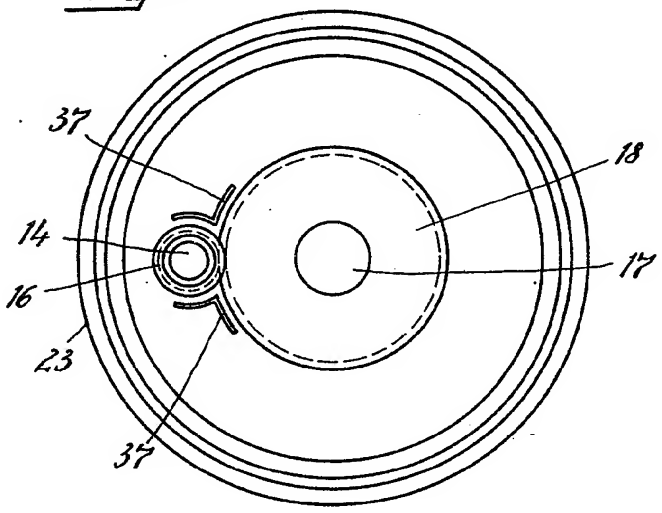


FIG. 2



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